the handheld gaming machine such that the sounds and the vibration are synchronized to indicate the wagering-game event.

[0012] In some aspects, the vibration is generated according to a vibrating profile which includes a vibration pattern, amplitude, and duration. The vibrating profile can include information representing an axis of rotation of the at least one actuator in three-dimensional space. The vibration pattern can include multiple frequency components, at least some of which are out-of-phase relative to one another.

[0013] According to another aspect of the present invention, a method of conducting a wagering game on a handheld gaming machine, the method includes receiving a wager to initiate a wagering game, displaying the wagering game on the handheld gaming machine, and indicating the occurrence of a wagering-game event by causing an actuator in the handheld gaming device to move a movable structure. The method may further include generating sounds through one or more speakers on the handheld gaming machine, the sounds and the vibration being synchronized to indicate the wagering-game event. In some aspects, the method further includes retrieving a vibrating profile corresponding to the wagering-game event and transmitting to the vibration device the vibrating profile, the vibrating profile being indicative of a vibration pattern, vibrating amplitude, and vibrating duration.

[0014] According to still another aspect of the present invention, a computer readable storage medium is encoded with instructions for directing a handheld gaming machine to perform a method according to any of the aspects of the present invention.

[0015] Additional aspects of the invention will be apparent to those of ordinary skill in the art in view of the detailed description of various embodiments, which is made with reference to the drawings, a brief description of which is provided below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. **1***a* is a perspective view of a free standing gaming machine embodying the present invention;

[0017] FIG. **1***b* is a perspective view of a handheld gaming machine embodying the present invention;

[0018] FIG. **2** is a block diagram of a control system suitable for operating the gaming machines of FIGS. **1***a* and **1***b;*

[0019] FIG. **3***a* is functional block diagram of a handheld gaming machine including one or more actuators according to an aspect of the present invention;

[0020] FIG. **3***b* is a cross-sectional illustration of an exemplary linear actuator suitable for use in the handheld gaming machine of FIG. **3***a* according to an aspect of the present invention;

[0021] FIG. **3***c* is an illustration of a rotary actuator providing vibration transmissions in two directions;

[0022] FIG. **4** is a flow chart depicting a method of actuating one or more actuators in a handheld gaming machine according to an aspect of the present invention;

[0023] FIG. **5***a*-**1** is a functional block diagram of a handheld gaming machine including a left actuator and a right actuator according to an aspect of the present invention;

[0024] FIG. **5***a*-**2** is an amplitude chart showing a vibrating profile of the left and right actuators of the handheld gaming machine shown in FIG. **5***a*-**1**;

[0025] FIG. **5***a*-**3** is an amplitude chart showing the position of a vibration that is perceived by a player as a result of the vibrating profiles shown in FIG. **5***a*-**2**;

[0026] FIG. **5***a*-**4** are amplitude charts illustrating two out-of-phase vibrations, creating a perception to the player that a vibration is moving across the handheld gaming machine shown in FIG. **5***a*-**1**;

[0027] FIG. **5***b* is a functional block diagram of a handheld gaming machine including four actuators, one each in the top-left, top-right, bottom-left, and bottom-right hand corners of the handheld gaming machine according to another aspect of the present invention;

[0028] FIG. **5***c* is a cut-away view of the front of the handheld gaming machine shown in FIG. **1***b* with two actuators that are rotatable about an axis such that each actuator can actuate on more than one axis;

[0029] FIG. **5***d* is a perspective view of a cluster of three actuators positioned to transmit vibrations along an x-axis, y-axis, and z-axis, respectively;

[0030] FIG. **6***a* is a vibrating-profile chart of a left actuator and a right actuator of a handheld gaming machine according to an aspect of the present invention;

[0031] FIG. **6***b* is a vibrating-profile chart of four actuators of a handheld gaming machine according to another aspect of the present invention;

[0032] FIGS. **7***a* and **7***b-c* are, respectively, isometric and frontal illustrations of haptic displays in accord with some aspects of the present invention;

[0033] FIGS. **8***a-b* are cross-sectional views of haptic displays according to some aspects of the present invention.

DETAILED DESCRIPTION

[0034] While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments illustrated.

[0035] Referring to FIG. **1***a*, a gaming machine **10** is used in gaming establishments such as casinos. With regard to the present invention, the gaming machine **10** may be any type of gaming machine and may have varying structures and methods of operation. For example, the gaming machine **10** may be an electromechanical gaming machine configured to play mechanical slots, or it may be an electronic gaming machine configured to play a video casino game, such as blackjack, slots, keno, poker, blackjack, roulette, etc.

[0036] The gaming machine **10** comprises a housing **12** and includes input devices, including a value input device **18** and a player input device **24**. For output the gaming machine **10** includes a primary display **14** for displaying information about the basic wagering game. The primary display **14** can also display information about a bonus wagering game and a progressive wagering game. The gaming machine **10** may, also include a secondary display **16** for displaying game events, game outcomes, and/or signage information. While these typical components found in the gaming machine **10** are described below, it should be understood that numerous other elements may exist and may be used in any number of combinations to create various forms of a gaming machine **10**.

[0037] The value input device **18** may be provided in many forms, individually or in combination, and is preferably located on the front of the housing **12**. The value input device **18** receives currency and/or credits that are inserted by a player. The value input device **18** may include a coin acceptor **20** for receiving coin currency (see FIG. **1***a*). Alternatively, or